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(54) Portable spraying device

(57) A piston 6 is reciprocated in a chamber 10 by means of a pivoted bell crank 4 having one arm connected to the piston and the other arm eccentrically connected to a shaft

3 rotated by a battery-operated electric motor 2. On the forward stroke of the piston 6 a side passage 11 to a liquid reservoir 12 is closed by an inlet valve 13 and an outlet valve 14 to a spray nozzle 16 is open. On the return stroke valve 13 opens and the outlet valve 14 closes.

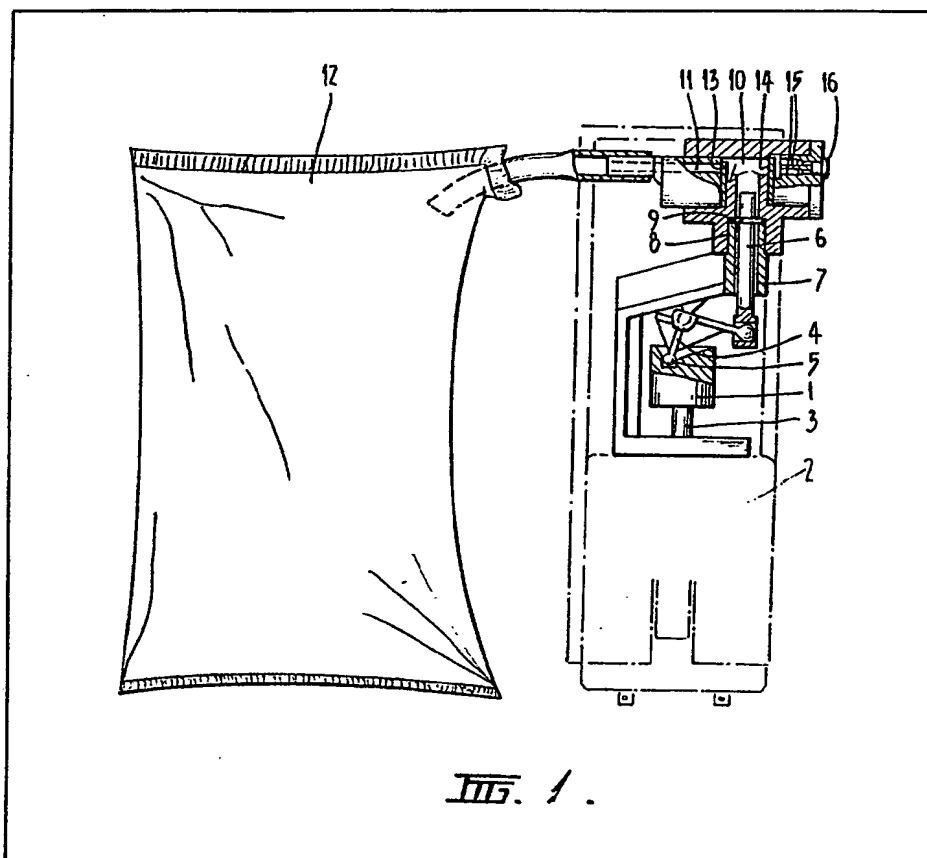


FIG. 1.

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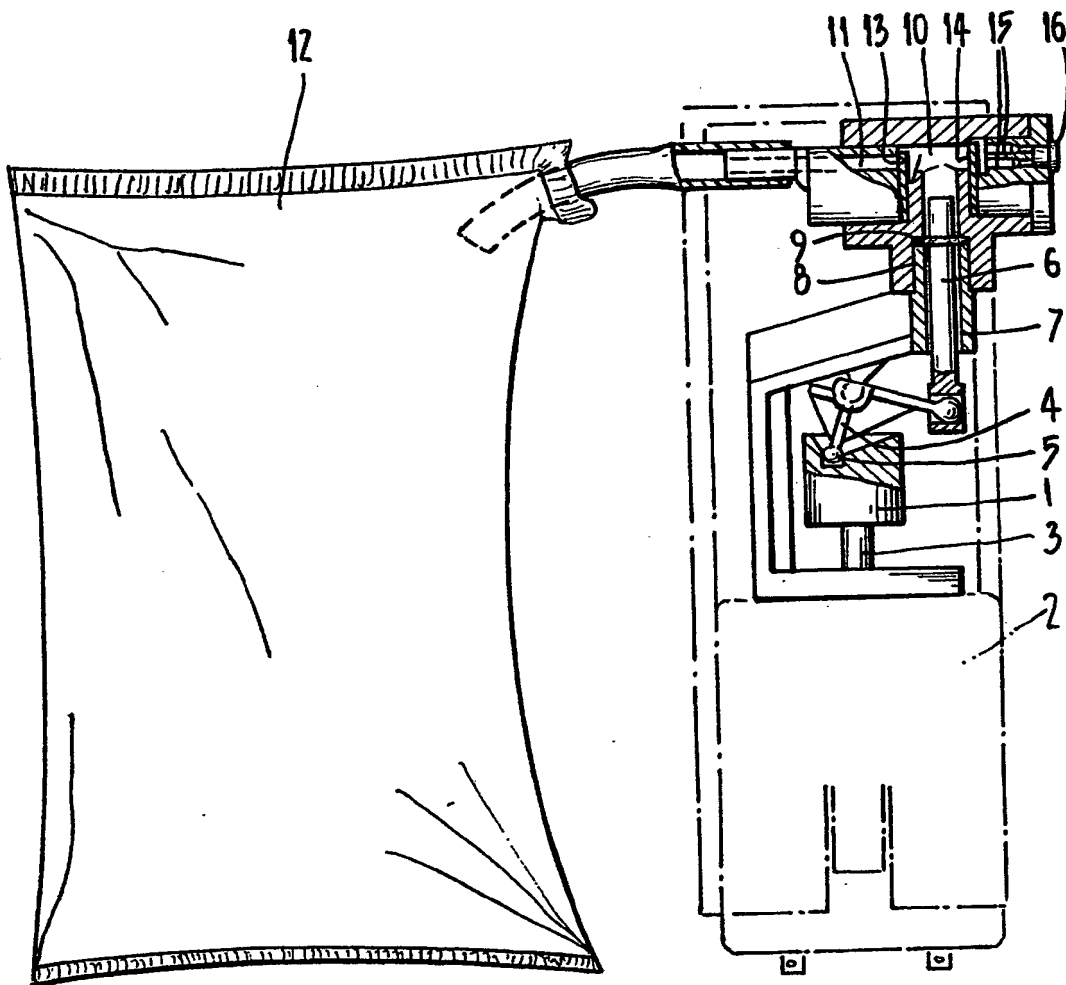


Fig. 1.

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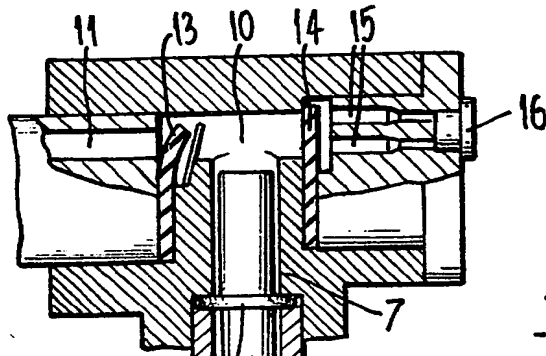


FIG. 2a.

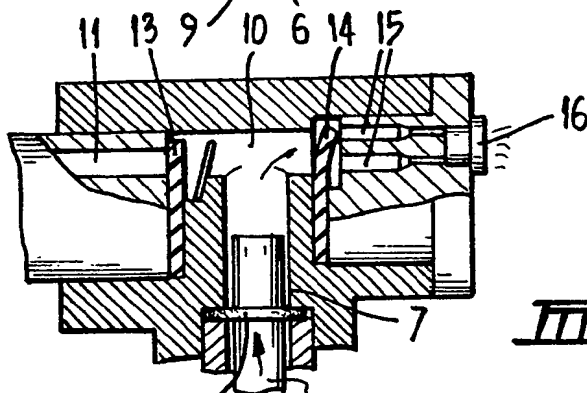
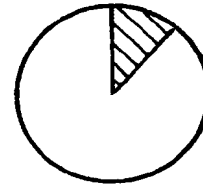


FIG. 2b.

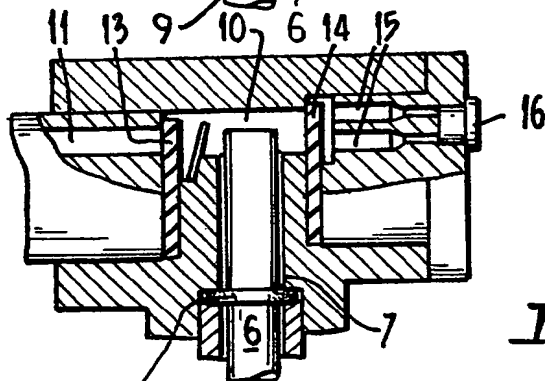
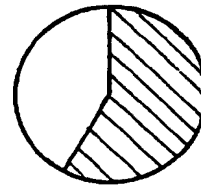


FIG. 2c.

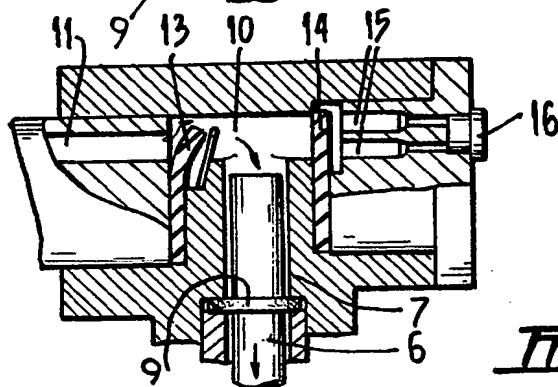
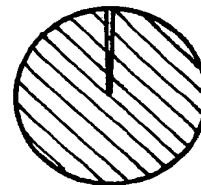
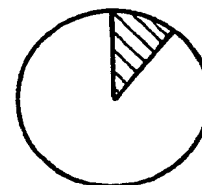


FIG. 2d.



SPECIFICATION

Portable spraying device

This invention relates to portable spraying devices for liquids.

5 Recently there has been widespread concern regarding the effect on the environment, particularly the upper atmosphere, of fluorocarbons released to the atmosphere by the use of aerosol packaging to dispense a wide variety of products in the form of a spray or mist. One particular object of this invention is to provide a device which will dispense such liquid products in a similar spray or mist form without the use of chemical propellants or the need for a pressurized package.

15 According to this invention there is provided a portable spraying device for liquids comprising means for converting a source of rotary motion into reciprocating motion, said means being adapted at one point to be permanently or demountably attached to the source of rotary motion and at another point being attached to and capable of operating the piston of a force pump, said piston being arranged to move in a cylinder formed in a body member, a piston seal located on said piston providing a sliding seal with the cylinder wall, the end of said cylinder opening into a first chamber, said first chamber being connected to a reservoir for the liquid to be sprayed by means of a passage provided with a non-return inlet valve to the said first chamber, said first chamber being connected to a second chamber or passages by a non-return outlet valve, said second chamber or passages being open to the atmosphere through a nozzle with one or more perforations therein, means located at the rear of the nozzle for imparting a swirling motion to the liquid prior to its being released as a spray through the perforation of perforations in the nozzle.

40 It is to be clearly understood that the present invention as well as being directed to the spraying device defined in the preceding paragraph also extends to (i) the combination of the spraying device and a container for the liquid to be dispensed, (ii) the combination of the spraying device and means supplying the source of rotary motion, and (iii) the combination of the spraying device, container for the liquid and the means supplying the source of rotary motion.

50 In a further particular preferred form of the invention the spraying device comprising the means for converting rotary motion to reciprocal motion, body member, piston, first chamber, second chamber or passages, swirling means and nozzle is connected to a collapsible plastic membrane reservoir containing the liquid to be dispensed, the whole combination being in the form of a single disposable unit adapted to be attached to a device supplying a source of rotary motion.

60 In a particular preferred form of the invention the source of rotary motion comprises an electric motor driven by a battery of dry cells. Such an assembly may conveniently be mounted in a

65 pistol-grip type housing for ease of operation.

The various integers of the spraying device may be made from any suitable material and the use of certain plastic materials such as high density polyethylene for some components is envisaged as is the use of metals.

70 The preferred means for converting rotary motion to reciprocating motion, comprises a bell crank so arranged that the fulcrum thereof is located, by means of a pivotal connection, on the housing for a reciprocating member, or on a member rigidly connected thereto, said reciprocating member being pivotally connected to the end of one arm of the bell crank, the end of the other arm of the bell crank being connected to a rotating cam member by a ball and socket joint at a point on the plane of rotation of said rotating member eccentric to the axis of rotation of said rotating member, said rotating cam member being adapted to be engaged and driven by a device supplying a source of rotary motion.

85 Reference is now made to Figure 1 of the accompanying drawings which illustrate one particular form of the invention. It is emphasised that this drawing is diagrammatic only.

90 In the drawing cam 1 rotates upon being driven by a battery operated electric motor 2 through motor shaft 3. One arm of crank 4 is demountably attached to the cam by means of ball and socket connection 5. The other arm of crank 4 is attached to piston 6 by means of ball and socket connection 7. Upon rotation of the cam the crank operates to transmit a reciprocating motion to piston 6 which moves in a cylinder 7 formed in body member 8. Piston 6 is fitted with a piston seal 9 which provides a sliding seal with the cylinder wall. The end of cylinder 7 opens into first chamber 10. Said first chamber 10 has a side passage 11 connecting it to a collapsible plastic membrane reservoir 12 for the liquid to be dispensed. During the forward stroke of the piston the side passage 11 is closed by non-return inlet valve 13 and non-return outlet valve 14 is opened and liquid under pressure is forced along longitudinal passages 15 to nozzle 16 (shown removed) and discharged to the atmosphere through a perforation of perforations in said nozzle. A rear face of the nozzle is provided with radial grooves which act to impart a swirling action to the liquid prior to it being released as a spray or mist through the perforation or perforations. On the rearward stroke of piston 6 non-return outlet valve 14 closes and non-return inlet valve 13 opens to admit liquid from reservoir 12 into first chamber 10.

120 The pumping cycle of the device of Figure 1 can be appreciated by an examination of Figures 2a to 2d which are crank cycle diagrams illustrating the action of non-return valves 13 and 14 with resultant flow of liquid, in response to movement of piston 6. Figure 2a represents the commencement of intake stroke, Figure 2b the commencement of compression stroke, Figure 2c top dead centre in first cycle and Figure 2d commencement of intake stroke — second cycle.

It will be appreciated that there may be made many modifications in details of the above described embodiment within the broad scope of the invention, and all such modifications are deemed to be within the ambit of the invention.

CLAIMS

1. A portable spraying device for liquids comprising means for converting a source of rotary motion into reciprocating motion, said means being adapted at one point to be permanently or demountably attached to the source of rotary motion and at another point being attached to and capable of operating the piston of a force pump, said piston being arranged to move in a cylinder formed in a body member, a piston seal located on said piston providing a sliding seal with the cylinder wall, the end of said cylinder opening into a first chamber, said first chamber being connected to a reservoir for the liquid to be sprayed by means of a passage provided with a non-return inlet valve to the said first chamber, said first chamber being connected a second chamber or passages by a non-return outlet valve, said second chamber or passages being open to the atmosphere through a nozzle with one or more perforations therein, means located at the rear of the nozzle for imparting a swirling motion to the liquid prior to its being released as a spray through the perforation or perforations in the nozzle.

2. A portable spraying device as claimed in claim 1 wherein the means for converting a source of rotary motion into reciprocating motion comprises a bell crank so arranged that the fulcrum thereof is located, by means of a pivotal connection, on the housing for a reciprocating member, or on a member rigidly connected thereto, said reciprocating member being pivotally connected to the end of one arm of the bell crank, the end of the other arm of the bell crank being connected to a rotating cam member by a ball and socket joint at a point on the plane of rotation of said rotating member eccentric to the axis of rotation of said rotating member, said rotating cam member being adapted to be engaged and driven by a device supplying a source of rotary motion.

3. The combination of a portable spraying device as claimed in claim 1 or 2 and a container for the liquid to be dispensed.

4. The combination of claim 3 wherein the container for the liquid to be dispensed is in the form of a collapsible plastic membrane reservoir.

5. The combination of a portable spraying device as claimed in claim 1 or 2 means supplying the source of rotary motion.

6. The combination of a portable spraying device as claimed in claim 1 or 2, a container for the liquid to be dispensed and means for supplying the source of rotary motion.

7. The combination of claim 3 or claim 4 formed as a single disposable unit adapted to be attached to a device supplying a source of rotary motion.

8. The device as claimed in claim 7, wherein the device supplying the source of rotary motion comprises an electric motor driven by a battery of dry cells.

9. A portable spraying device substantially as described with reference to Figure 1 of the drawings.

New claims filed on 19 December 1979

Superseded claims 1 to 9

New or amended claims:—

1. A portable spraying device for liquids comprising means for converting rotary motion into reciprocating motion including a bell crank so arranged that the fulcrum thereof is located, by means of a pivotal connection, on a housing or on a member rigidly connected thereto, a force pump piston pivotally connected to the end of one arm of the bell crank to be reciprocated thereby, the end of the other arm of the bell crank being connected to a rotatable cam member by a ball and socket joint at a point on the plane of rotation of said cam member eccentric to the axis of rotation of said cam member, said cam member being adapted to be engaged and driven by a source of rotary motion, said piston being arranged to move in a cylinder formed in said housing, a piston seal located on said piston to provide a sliding seal with the cylinder wall, an end of said cylinder opening into a first chamber, said first chamber communicating with a liquid supply passage provided with a non-return inlet valve to said first chamber, said first chamber being connected to a second chamber or passages by a non-return outlet valve, said second chamber or passages being open to the atmosphere through a nozzle with one or more perforations therein, and means located at the rear of the nozzle for imparting a swirling motion to the liquid prior to its being released as a spray through the perforation or perforations in the nozzle.

2. The combination of a portable spraying device as claimed in claim 1 and a container for the liquid to be sprayed.

3. The combination of claim 2 wherein the container for the liquid to be sprayed is in the form of a collapsible plastics membrane reservoir.

4. The combination of a portable spraying device as claimed in claim 1 and a source of rotary motion.

5. The combination of portable spraying device as claimed in claim 1, a container for the liquid to be sprayed, and a source of rotary motion.

6. The combination of claim 2 or claim 3 formed as a single disposable unit adapted to be

attached to a source of rotary motion.

7. The combination as claimed in claim 6 wherein the unit is adapted to be attached to a said source comprising an electric motor driven by

5 a battery of dry cells.

8. A portable spraying device substantially as described herein with reference to Figure 1 of the accompanying drawings.

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